

# Asbestos Exposure Assessment Main Interior Building Cafeteria

Office of Managing Risk and Public Safety  
Office of Policy, Management and Budget  
Office of the Secretary

December 2002

## **Note to Readers of the On-Line Copy of this Report**

This report was prepared by the Office of Managing Risk and Public Safety (MRPS) in December 2002. Questions or requests for additional information should be directed to the author, Robert Garbe, MRPS, 755 Parfet Street, Suite 364, Lakewood, Colorado 80215, 303-236-7128x230, [Robert\\_Garbe@ios.doi.gov](mailto:Robert_Garbe@ios.doi.gov). The voluminous reports referenced in the Appendix may be reviewed by contacting (1) the author, (2) Diane Schmitz, MRPS, Room 3454, Main Interior Building, 1849 C Street, NW, Washington, DC 20240, 202-219-0189, [Diane\\_Schmitz@ios.doi.gov](mailto:Diane_Schmitz@ios.doi.gov), or (3) Ian Rosenblum, National Business Center, Room 1222, Main Interior Building, 1849 C Street, NW, Washington, DC 20240, 202-208-5795, [Ian\\_M\\_Rosenblum@nbc.gov](mailto:Ian_M_Rosenblum@nbc.gov).

## **Table of Contents**

<b>EXECUTIVE SUMMARY</b>	<b>3</b>
<b>INTRODUCTION</b>	<b>4</b>
<b>CONCLUSIONS</b>	<b>4</b>
<b>SAMPLING METHODS AND RESULTS</b>	<b>5</b>
<b>Sampling associated with renovation project</b>	<b>5</b>
Renovation Project Air Samples	5
<b>Routine Air Sampling</b>	<b>6</b>
Routine Sampling	7
Additional Episodic Air Samples	8
<b>STANDARDS AND INTERPRETATION OF DATA</b>	<b>8</b>
<b>HEALTH EFFECTS OF ASBESTOS EXPOSURE</b>	<b>10</b>
<b>RISK ASSESSMENT DISCUSSION</b>	<b>11</b>

## **Executive Summary**

In the process of removing asbestos containing pipe insulation in the central maintenance room in the basement of the Main Interior building (MIB), airborne levels of asbestos were found to be above the EPA and Washington D.C clearance thresholds. Air monitoring is conducted routinely during asbestos abatement activities to ensure the work is performed properly and that the area is adequately cleaned before allowing access to the room. Further spot sampling in the cafeteria and other rooms at MIB was performed as a precaution, and two of these samples, one in the cafeteria and one in the central maintenance room was found to also be above clearance limits for occupied space. While these airborne asbestos levels did not exceed any health standards, they did indicate the need for further cleaning and assessment. A discussion of the relevant health standard, measurement methods, and risk assessment process is detailed in the main report.

The analysis detailed in this report indicates that asbestos exposures to employees of the cafeteria, patrons of the cafeteria or employees in the building as a result of the October incident as well as any previous time have been negligible. Based on the results of the environmental sampling reviewed, no building occupants have been nor need to be referred for matriculation into a medical surveillance program.

## **Introduction**

In the process of removing asbestos containing pipe insulation in the central maintenance room in the basement of the Main Interior building, airborne levels of asbestos were found to be above the EPA and Washington D.C clearance thresholds. Air monitoring is conducted routinely during asbestos abatement activities to ensure the work is performed properly and that the area is adequately cleaned before allowing access to the room. Further spot sampling in the cafeteria and other rooms at MIB was performed as a precaution, and two of these samples, one in the cafeteria and one in the central maintenance room was found to also be above clearance limits for occupied space. While these airborne asbestos levels did not exceed any health hazard standards, they did indicate the need for further cleaning and assessment.

This report evaluates the potential for asbestos exposure of Main Interior Building employees. It includes a review and interpretation of the routine air sampling data taken as part of the Asbestos Operations and Maintenance Plan and data collected as a result of the recent (October 30, 2002) incident.

## **Conclusions**

Evaluation of the historical air monitoring data for the past decade and air sample results taken during the “incident” of October 30-November 4, indicates that asbestos exposure to cafeteria employees and patrons is, and was, negligible.

In particular, historical building asbestos air sampling performed on August 29, 2002 and previously during the past decade were below acceptable limits.

A brief “spike” of asbestos in the cafeteria occurred on October 31<sup>st</sup>, which while detectable by the Transmission Electron Microscopy (TEM) analysis, still resulted in an airborne concentration (as calculated by the NIOSH 7402 method) below applicable health standards. Air samples taken of other employee occupied spaces during this time period were below clearance thresholds, as were extensive samples taken throughout the MIB on 2-3 November, 2002. More detailed information on the sampling results as well as a discussion of air sampling methods and standards can be found later in this report.

Based on this analysis, asbestos exposures to employees of the cafeteria, patrons of the cafeteria, or employees in the building as a result of the October incident or any previous time have been negligible. Employers are required to institute a medical surveillance program for all employees who are exposed or will be exposed at or above OSHA’s permissible exposure limit of 0.1 fiber per cubic centimeter of air (f/cc). Based on the results of the environmental sampling reviewed, no building occupants meet this criterion. Consequently, no employees need to be referred for matriculation into a medical surveillance program.

## Sampling Methods and Results

### ***Sampling associated with renovation project***

On October 30, 2002 air sampling data obtained in conjunction with a small scale asbestos removal in the Central Maintenance room in the basement of the Main Interior building indicated the potential presence of airborne asbestos. While this sample did not show a detectable level of fibers, the analyst was alerted to the possibility that airborne asbestos could be present in the maintenance room. Therefore, this one sample was further analyzed using TEM, which is a method that permits the specific identification of asbestos in the presence of other non-hazardous fibrous material. This TEM analysis indicated the presence of asbestos at a level of 400 structures/per square millimeter ( $\text{ss}/\text{m}^2$ ), a level above the clearance criteria for opening an area for general occupation. Due to this sample result, and in view of the fact that air handlers for the Cafeteria and several office spaces on the first floor are in this central maintenance room, further sampling was initiated in the central maintenance room, and other areas served by the heating, ventilation and air conditioning (HVAC) units. These results confirmed the presence of asbestos fibers in the central maintenance room and indicated airborne asbestos fibers present in the cafeteria. The other areas sampled showed negligible levels. It should be noted that the cafeteria was not part of the abatement action and had not been cleaned beyond normal housekeeping at the time of sampling.

The source of the fibers detected in the cafeteria has not been identified. Possibilities include tracking in from other areas such as the central maintenance room where contract work was being done; dispersion from ventilation systems housed in the central maintenance room; or from spray applied material on the ceiling of the cafeteria, which has some areas of damage from prior water leaks. Steps taken during the cafeteria cleanup to prevent the sprayed on ceiling material from being disturbed will prevent it as being a future source of asbestos exposure. Extensive cleaning of the cafeteria area and the central maintenance room will prevent these areas from being future “track-in” sources. Further, the HVAC units in the central maintenance room have been sealed with plastic to prevent air from being pulled from that room to the cafeteria or to the 1<sup>st</sup> floor office spaces.

### Renovation Project Air Samples

Date of Sampling	Number of Samples	Results	Location
October 30, 2002	1 PCM 1 TEM	<0.01 f/cc 400 ss/mm <sup>2</sup>	Central Maintenance Room
October 31, 2002	8 TEM	6 samples - <70 ss/mm <sup>2</sup> 1 sample - 124 ss/mm <sup>2</sup> 1 sample - 248 ss/mm <sup>2</sup>	Central Maintenance Room Cafeteria
November 3, 2002	10 TEM	<70 ss/mm <sup>2</sup>	Cafeteria
November 1-3, 2002	216 PCM 30 TEM	<0.01 f/cc <70 ss/mm <sup>2</sup>	Throughout MIB Throughout MIB
November 5, 2002	6 PCM	< 0.01 fibers/cc	Cafeteria area

### ***Routine Air Sampling***

Routine air sampling data obtained in accordance with the NIOSH 7400 method (PCM) has been performed periodically for the past 13 years. A summary of this data is provided below. Over this period, 1125 routine air samples have been taken with 27 samples at or above 0.01 fiber/cc. Of these 27 samples, 8 confirmatory TEM or SEM [sic] analysis have found no asbestos samples over the applicable clearance standards. Detailed Air Sampling Reports are provided in the Appendix.

In addition to the routine air sampling done periodically over the past 13 years, a number of additional general area air monitoring samples in or around the cafeteria area have been taken for specific purposes. These are summarized below. Detailed Air Sampling Reports are provided in the Appendix.

A huge amount of air sampling data has been taken over the past 13 years in support of specific asbestos abatement work. All of these samples showed air levels below the clearance level of <0.01 f/cc. Since this data was specific to asbestos levels inside of containment areas, and not indicative of general areas around or in the cafeteria, these samples are not included in this report.

## Routine Sampling

Date of Sampling	Number of Samples	Results
Aug/September 2002	120	all <0.01 f/cc
Samples #18+19 sampled on 29 Aug 02 reanalyzed using TEM (AHERA)	2	< 70 ss/m2
September 2001	115	all <0.01 f/cc
1999-1996 not obtained		
May 1995	110	all <0.01 f/cc
May 1994	105	all <0.01 f/cc
May 1993	95	all <0.01 f/cc
May 1992	95	all <0.01 f/cc
May 1991	101	all <0.01 f/cc
April 1990	25	1 sample @0.62 f/cc (Mezzanine Mechanical)
June 1989	75	7 samples >0.01 f/cc 15 samples @0.01 fiber/cc (mezzanine, rooms 6531, 5559, 4004, 3354, 1081, Mechanical Room D-260) 4 samples reanalyzed by TEM showed no asbestos fibers present
April 1988	72	4 Samples >0.01 f/cc (3 <sup>rd</sup> and 5 <sup>th</sup> floor) Reanalyzed by SEM (Scanning Electron Microscopy); all <0.01 f/cc when only SEM determined asbestos fibers are counted.
April 1987	96	All <0.01 f/cc
November 1985	9	All <0.01 f/cc

## Additional Episodic Air Samples

Date of Sampling	Number of Samples	Results	Location
January 2002	11 PCM 4 TEM	4 samples >0.01 f/cc No asbestos fibers	Central Maintenance Room
August 2000	6 TEM 7 microvac settled dust particles	No Asbestos detected No Asbestos detected	4 <sup>th</sup> floor
May 1994	11 PCM	All <0.01 f/cc	Central Maintenance Room

## Standards and Interpretation of Data

Asbestos is the name given to a group of six different naturally occurring minerals. Presence of asbestos in a very low level in the environment is therefore expected. Asbestos was widely used as a construction material in buildings through the late 1970s and the MIB does contain asbestos. Intact, undisturbed asbestos-containing materials in buildings do not pose a health risk. Respirable fibers, in sufficient concentration, do pose a significant health hazard.

OSHA regulates occupational exposure to asbestos in construction and general industry. OSHA's Permissible Exposure Limit (PEL) for asbestos historically has been revised downward starting from 12 f/cc in 1972 to today's PEL of 0.1 f/cc for an 8 hour time weighted average. The current regulation also has an excursion limit of 1.0 f/cc for any 30 minute sampling period. The standard requires medical surveillance of employees exposed above the PEL. Employers are required to institute a medical surveillance program for all employees who are exposed or will be exposed at or above the permissible exposure limit (0.1 f/cc). The components of the examination are described in the OSHA asbestos standard and include medical history, physical examination, laboratory testing, pulmonary function testing and chest radiography.

The OSHA standards are based on the National Institute of Occupational Safety and Health (NIOSH) 7400 analytical protocol using phase contrast light microscopy (PCM) and counting fibers which are greater than 5  $\mu$ m with a length to width (aspect) ratio of 3:1. This definition of a biologically active fiber is based on medical data suggesting that fibers of this length cannot be removed from the lung tissue via macrophage activity. Also, this definition is what was used to evaluate exposures for the epidemiological studies on worker lung disease. Therefore, the breadth of health outcome data is based on exposure measurements using the NIOSH 7400 definition of an asbestos fiber. This method does not differentiate between asbestos and non-asbestos fibers and fiber counts using this method may include other materials such as gypsum, fibrous glass, rock wool or other material.



TEM using NIOSH method 7402 can be used in conjunction with PCM to confirm the presence of asbestos fibers. This method uses the same criteria of  $>5\mu\text{m}$  and an aspect ratio  $>3:1$ . The TEM method specifically provides identification of asbestos fibers versus other kind of fibers (rock wool, gypsum, etc.) and has a much greater ability to detect shorter and thinner asbestos fibers. These are the only methods used to measure occupational exposures.

In 1986 the Environmental Protection Agency implemented the Asbestos Hazard Emergency Response Act (AHERA) which mandated asbestos abatement in schools and established clearance criteria for re-occupying school buildings. These procedures have been adopted for use in asbestos abatement clearance for other buildings and are now widely used for determining a proper clean-up. For projects using containment, the standard specifies a clearance level of  $70\text{ ss/m}^2$  of filter based on the TEM analytical method. This is based on the level of asbestos that was expected as background contamination of the filter media at the time the protocol was established. However, the clearance level of  $70\text{ ss/m}^2$  is still used in spite of the fact that filter media has improved over the last decade and a half to the point where the background concentration approaches zero asbestos fibers. Since this clearance level of  $70\text{ ss/m}^2$  is based on the background amount on filter media, it does not have an association with the airborne concentration of fibers. The method specifies 5 samples from the clearance area, 5 from ambient outdoor air, 2 field blanks, and 1 analytical blank. Averages from the clearance area and outdoor area are compared.

For the first 2 years after promulgation of AHERA, the standard allowed for the use of PCM for clearance analysis and the samples must be below  $0.01\text{ f/cc}$ . This concentration has been adopted by states such as Minnesota and Maryland as a clearance standard.

The AHERA analytical method uses TEM which gives much greater resolution than the PCM method. It also can differentiate between asbestos and non-asbestos fibers and can detect fibers much shorter and thinner than the PCM method. However, very little scientific data is available concerning physiological responses to fiber sizes below  $5\mu\text{m}$ , and the clearance standard is not based on health outcome data. Numerous animals studies have shown that the shorter fibers are cleared from the lung tissue over a period of days, while the fibers  $5\mu\text{m}$  and greater are retained causing the well-documented physiological responses. Therefore, levels above  $70\text{ ss/m}^2$  do not necessarily imply an immediate health threat.

EPA regulations concerning asbestos exposure parallel OSHA regulations, particularly with respect to work practices and requirements for medical surveillance. Significantly, EPA does not require or recommend medical surveillance at concentrations lower than OSHA regulations.

According to NIOSH, TEM asbestos fiber counts analyzed by AHERA methods for clearance should only be used for determining the effectiveness of the clean-up work, and not to establish an estimate of health risk. They also state that PCM using NIOSH 7400

or TEM using NIOSH 7402 are the accepted methods for determining exposure potential and therefore risk of adverse health outcomes.

Some argue that we have sufficient medical data showing 5 um and greater fibers are a much greater risk, but we don't have sufficient data to say fibers less than 5 um are not a risk. In their opinions, the health research data and regulatory standards are lagging behind the analytical technology.

Based on the information above it is apparent that PCM analysis or TEM analysis using NIOSH 7402 method for determining PCM equivalents are the methods used to evaluate health risk levels. However, in order for a site to be considered adequately cleaned, it must meet the AHERA clearance levels.

## **Health Effects of Asbestos Exposure**

Well-documented epidemiological studies have shown a definite association between elevated exposure to asbestos and an increased incidence of lung cancer, pleural and peritoneal mesothelioma and asbestosis. The later is a disabling fibrotic lung disease that is caused by exposure to asbestos on a dose response basis. Diseases associated with asbestos (typical of many chronic occupational diseases) appear about 20 years following the first occurrence of exposure. (Mesothelioma has a much longer latency period - 40 years). There are no known acute effects associated with exposure to asbestos. The signs and symptoms of these diseases are not unique to asbestos and would present clinically the same as lung cancer and interstitial lung disease from any cause.

Fibers are deposited in the lung and remain due to their insoluble nature and the inability of the lung macrophages to engulf and remove longer fibers (>5 microns in length). These fibers can create localized tissue damage, stimulate the immune system, and create a scarring of the lung. Asbestosis has been observed in workers exposed over several years to levels well above the OSHA PEL. It is believed the cumulative exposure to asbestos correlates to the development of asbestosis.

Asbestos exposure is known to increase lung cancer incidence, particularly for high-level occupational exposures over an extended period of time (e.g., decades). Additionally, some studies have indicated increased lung cancer and mesothelioma rates due to high naturally occurring levels of asbestos. Although the exact mechanism for lung cancer is not known, it is believed the localized immune response to the asbestos may contribute to cancer. Fibers may also migrate out of the lung and cause mesothelioma, a cancer specific to the lining around the lungs. In general, shorter fibers (less than 5 microns) are more efficiently cleared from the lung and therefore are less potent. Additionally, there is some indication that chrysotile asbestos is less potent than other forms of asbestos due to better clearance from the lungs. The risk of cancer among exposed workers is greatly increased among smokers versus non-smoking exposed workers. Cessation of smoking reduces the risk of lung cancer for any person exposed to asbestos.

## **Risk Assessment Discussion**

The purpose of the air sampling during the MIB asbestos removal (glove bag) on October 30, 2002 was to determine if the abatement activities released fibers into the building environment. Due to the limited size of the abatement work (approximately 10 linear feet), these working samples were also considered to be final clearance samples. After receiving an elevated result during the glove bag removal, additional samples were collected in the cafeteria and adjacent offices. This sampling was done strictly for precautionary measures and not for clearance purposes. Cleaning in both the central maintenance room and cafeteria was performed to act responsibly on the sample findings.

A comparison of the PCM or TEM-PCM equivalent method to the occupational exposure standards of 0.1 f/cc, do not indicate a health risk from asbestos exposure and did not detect fibers >5  $\mu\text{m}$ . However, the TEM analysis did reveal the presence of fibers <5  $\mu\text{m}$  on 3 separate samples (two in the central maintenance room and one in the cafeteria). Although the numbers of samples taken and sampling procedures did not strictly follow the AHERA methods, the results were an indication that the affected areas should be cleaned further prior to re-occupancy, which was exhaustively done. Drawing conclusions about health risk from AHERA fiber counts is not advisable.

The analysis of previous samples taken in the cafeteria in August 2002 samples did not detect any asbestos fibers. This suggests that the TEM samples taken during the October 20, 2002 incident do not represent a steady state background concentration or long term concentrations in the cafeteria, but are a short term, or transient condition associated with the disturbance of asbestos containing material.

The source of the fibers detected in the cafeteria has not been identified. Possibilities include tracking in from other areas such as the central maintenance room where contract work was being done; dispersion from ventilation systems housed in the central maintenance room; or from spray applied material on the ceiling of the cafeteria, which has some areas of damage from prior water leaks. Steps taken during the cafeteria cleanup to prevent the sprayed on ceiling material from being disturbed will prevent it as being a future source of asbestos exposure. Extensive cleaning of the cafeteria area and the central maintenance room will prevent these areas from being future “track-in” sources. Further, the HVAC units in the central maintenance room have been sealed with plastic to prevent the potential of air being pulled from that room to the cafeteria or to the 1<sup>st</sup> floor office spaces.

Evaluation of the historical air monitoring data for the past decade and air sample results taken during the “incident” of October 31-November 4, indicates that asbestos exposure to cafeteria employees, patrons and building occupants is, and was, negligible. Employers are required to institute a medical surveillance program for all employees who are exposed or will be exposed at or above the permissible exposure limit (0.1 f/cc). Based on the results of the environmental sampling reviewed to date, no building occupants have been nor need to be referred for matriculation into a medical surveillance program.